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COLLEGE OF ARTS AND SCIENCES ANNOUNCEMENT OF THE DEPARTMENT OF CHEMISTRY 1920-1921

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COLLEGE OF ARTS AND SCIENCES

COURSE IN CHEMISTRY

The College of Arts and Sciences offers a four-year course leading to the degree of Bachelor of Chemistry. This course is designed primarily to prepare the student for the profession of chemistry, either in the field of teaching or in the chemical industries. It includes adequate instruction in allied subjects, such as mathematics, physics, and engineering, that are usually comprised in courses elsewhere designated "Chemical Engineering." It moreover includes extended instruction not only in the fundamental divisions of chemical science, but also in numerous special branches designed to acquaint the student with the best modern methods of attacking the many varied problems that may arise in the future practice of his profession.

REQUIREMENTS FOR ADMISSION

The entrance requirements to the course leading to the degree of Bachelor of Chemistry will be found on page 11 of the General Circular of Information issued by the University.

COURSE OF STUDY LEADING TO THE DEGREE OF BACHELOR OF CHEMISTRY

The degree of Bachelor of Chemistry will be awarded to those who have satisfactorily completed the following curriculum:

First Year		No. of Course	First Term	Second Term
Introductory Inorganic Chemistry	Chemistry	1	6	—
Qualitative Analysis	Chemistry	7	6 or 0	0 or 6
Analytical Geometry, Differential Calculus, Integral Calculus	Mathematics	7	5	5
Introductory Experimental Physics	Physics	2	—	5
Drawing	Sibley College	D 3	3	—
English	English	1	3	3
Second Year				
Quantitative Analysis	Chemistry	12	0 or 6	6 or 0
Gas Analysis	Chemistry	19, 20	4 or 0	0 or 4
Introductory Chemical Spectroscopy	Chemistry	24	—	3
Organic Chemistry	Chemistry	30	6	6
Light and Heat	Physics	8c	2	—
Physical Experiments	Physics	14	—	2
Introductory Mineralogy	Geology	11	0 or 3	3 or 0
or				
Crystallography	Geology	12	0 or 3	3 or 0
Elective				3

Third Year

		No. of course	First Term	Second Term
Advanced Quantitative Analysis	Chemistry	14	2	2
Quantitative Analysis, Lectures	Chemistry	15	—	2
Introductory Physical Chemistry	Chemistry	50	3	3
Physical Chemistry Laboratory	Chemistry	51	3	3
Introductory Chemical Microscopy	Chemistry	65	0 or 2	2 or 0
General Physics	Physics	9c	2	—
Physical Experiments	Physics	14	2	—
Mechanics	Sibley College	M5	5	—
Mechanical Laboratory	Sibley College	X12	—	4
Elective				3

Students who wish to register in the junior year for a greater number of elective hours than the schedule demands may, with the approval of the Department, be permitted to defer taking some of the required courses of the junior year.

Fourth Year

Introductory Industrial Chemistry	Chemistry	80	3	3
Seminary	Chemistry	95	—	1
Research	Chemistry	96	(at least) 4	4
Electrical Engineering Laboratory	Sibley College	E12	4	—
Electives			(at least) 5	5

The elective courses required in the curriculum may be chosen by the student, in each case with the approval of the Department of Chemistry, from the advanced courses in chemistry, or from certain courses in other departments of the College of Arts and Sciences or in other colleges of the University.

Students in the Course in Chemistry may register for 20 hours a term. To register for more than 20 hours, the student must first secure the consent of the Department.

Information concerning tuition, fees, living expenses, scholarships, prizes, financial assistance, and opportunities for self-support will be found in the General Circular of Information, which may be obtained from the Secretary of Cornell University, Ithaca, N. Y.

COURSES OF INSTRUCTION OFFERED BY THE DEPARTMENT OF CHEMISTRY
1920-1921

INTRODUCTORY INORGANIC CHEMISTRY

1. **Introductory Inorganic Chemistry.** Lectures, recitations, and laboratory. Repeated in second term, credit six hours.

1a. Lectures, first term, three sections, M W F, 9, 10, 11. Professor BROWNE and Mr. GRIFFIN. Rockefeller A. Second term, M W F, 10. Mr. MCKINNEY and Mr. GRIFFIN.

1b. Recitations (one hour a week, to be arranged). Laboratory, first term, M F, 2–4.30; T Th, 2–4.30; W, 2–4.30 and S, 8–10.30; second term, M F, 2–4.30; T Th, 2–4.30; W, 2–4.30 and S, 8–10.30; M W, 8–10.30. Mr. MCKINNEY and Messrs. LINDSLEY, COREY, LANG, LAUBENGAYER, HELPS and ———.

Entrance credit in chemistry does not carry with it university credit in course 1. If a student entering the University from a preparatory school desires credit in course 1 he must pass an examination set by the Department of Chemistry. This examination is held both in New York City and in Ithaca on the same day in September as the entrance examination. University credit in course1 that is obtained by passing this examination does not carry with it entrance credit in chemistry.

Examinations for those who were unavoidably absent from the final examination in cour e 1 will be held at 2 p. m. on the day before instruction begins in the fall.

ANALYTICAL CHEMISTRY

5. **Analytical Chemistry for Engineers.** Repeated in second term, credit three hours. Prerequisite, course 1. Mr. RIDER and Messrs. SHERBURNE, BARRETT, HARTT, LIPPINCOTT, ———, ——— and ———. Lecture, F, 12, Rockefeller A. Laboratory, T Th, 9–12; M W, 2–5.

6. **Qualitative and Quantitative Analysis.** Repeated in second term, credit five hours. Prerequisite, course 1. Mr. RIDER and Messrs. SHERBURNE, BARRETT, HARTT, LIPPINCOTT, ———, ——— and ———. Lectures, T Th, 12, Rockefeller A. Laboratory sections, M W F, 2–4.30; T Th S, 8–10.30; T Th S, 9–11.30.

Qualitative analysis: the properties and reactions of the common elements and acids and their detection in various liquid and solid mixtures.

Quantitative analysis: the preparation and use of volumetric solutions and work in elementary gravimetric analysis.

Examinations for those who were unavoidably absent from the final examination in cour e 6 will be held at 2 p. m. on the day before instruction begins in the fall.

7. **Qualitative Analysis.** Repeated in second term, credit six hours. Prerequisite, course 1. Mr. RIDER and Mr. LIPPINCOTT. Lectures, T Th S, 8, Rockefeller B. Laboratory, first term, M W F, 2–4.30, S, 9–12; second term, T Th, 1.30–5.15, S, 9–12.

The properties and reactions of the common elements, and of the common inorganic and organic acids, also the qualitative analysis of a number of solutions and solid mixtures.

Students in science are advised and candidates for the degree of Bachelor of Chemistry are required to take this course instead of course 6.

[9. **Advanced Qualitative Analysis.** Repeated in second term, credit one, two, or three hours. Prerequisite, courses 7, 12 and 30. Mr. RIDER. Laboratory sections at hours to be arranged.

Essentially a continuation of course 7. A study of the most approved methods for separating and detecting a large number of metals and acids not studied in course 7, including many of the rare elements. In certain cases a comparative study is made of different methods designed to accomplish a given separation.

The qualitative analysis of a number of solutions, solid mixtures, and minerals will be required. For graduates and advanced undergraduates.] Not given in 1920–1921.

12. **Introductory Quantitative Analysis.** Repeated in second term, credit six hours. Prerequisite, course 6 (or preferably 7). Mr. NICHOLS and Messrs. BRANDES, MCELFRESH, MOODY and CURPHEY. Lectures, T Th, 9, Morse 119.

Laboratory sections, first term, M T W, 2.00–5.30; T Th, 10–1; S, 8–1; second term, W Th F, 2–5.30; T Th, 10–1; S, 8–1. Recitation sections at hours to be arranged.

The preparation and standardization of various volumetric solutions and their use in analyzing a variety of substances; gravimetric methods.

Students in science are advised and candidates for the degree of Bachelor of Chemistry are required to take this course instead of the quantitative analysis of course 6.

14. **Advanced Quantitative Analysis.** Repeated in second term, credit two to four hours. Prerequisite, course 6 (or 7 and 12). Mr. NICHOLS and Messrs. BRANDES, MCELFRESH, MOODY and CURPHEY.

Laboratory sections: First term, M T W, 2–5.30; T Th, 9–1; S, 8–1; second term, W Th F, 2–5.30; T Th, 10–1; S, 8–1. Recitation sections at hours to be arranged.

Gravimetric, volumetric, and electrolytic methods of analysis, and methods of combustion analysis; analysis of iron ores, iron and steel, special alloys, slags, coal and coke, cements and cement materials, alloys, minerals, ores of copper, lead, zinc, mercury, manganese, tin, etc.

15. **Advanced Quantitative Analysis.** Lectures. Second term, credit two hours. Prerequisite, course 50 (first term). M W, 10. Mr. NICHOLS. Selected topics in advanced quantitative analysis.

16. **Electrochemical Analysis.** Repeated in second term, credit one to two hours. Prerequisite, course 12. Laboratory sections at hours to be arranged. Mr. NICHOLS and Mr. BRANDES.

A study of the most approved electrochemical methods for the determination of silver, lead, copper, tin, nickel, cobalt, and zinc. Practice will be given in the analysis of alloys and ores.

18. **Assaying.** First term, credit three hours. Prerequisite, course 6 (or 7 and 12), and if possible a course in mineralogy. Lectures, F, 10, Morse C. Laboratory, M W, 2–5. Mr. NICHOLS and Mr. BRANDES.

Lectures on the theory and practice of the scorification and crucible assay, and on the metallurgy of copper, lead, zinc, silver, and gold. In the laboratory, practice is given in assay of zinc, lead, copper, gold and silver ores, mattes, and bullion. Designed for students specializing in chemistry and as an elective for students in mechanical and civil engineering.

19. **Qualitative and Quantitative Gas Analysis.** Lectures. Repeated second term, credit two hours. Prerequisite, course 6 (or 7) and Physics 2. Course 19 should be preceded or accompanied by course 12. M W, 11, Morse 119. Mr. NICHOLS.

A discussion of the apparatus and methods employed (a) in the examination of the important industrial gases, (b) in the determination of the heating value of fuels, and (c) in gas evolution experiments. Problems are assigned which afford practice in the calculation and interpretation of results.

20. **Technical Gas Analysis.** Laboratory. Repeated second term, credit two hours. Open to those who are taking or have taken course 19. Laboratory sections, M T, 2–4.30; W Th, 2–4.30; T Th, 10-12.30; S, 8–1. Mr. NICHOLS and Messrs. BLACKBURN and SCHNEE.

The analysis of gas mixtures with various forms of apparatus; the complete analysis of flue gas, coal gas, Pintsch gas, Blau gas, natural gas, producer gas, acetylene, and air; the determination of the heating power of gaseous, liquid, and solid fuels; the analysis of various substances by gas analytical methods involving the use of the different types of gas evolution apparatus. Within

certain limits the work may be selected to suit the requirements of the individual student.

[21. **Advanced Gas Analysis.** Second term, credit one or more hours. Prerequisite, courses 19 and 20. Laboratory practice at hours to be arranged. Mr. NICHOLS.

[Special topics in the field of either scientific or industrial gas chemistry, varied to suit the needs of the student.] Not given in 1920–1921.

24. **Introductory Chemical Spectroscopy.** Repeated second term, credit three hours. Prerequisite, course 6 (or 7 and 12), and Physics 2. Open only to those who are taking or have taken Physics 8c. Lectures, M W, 8, Morse 119. Laboratory sections, M T W Th F, 2–4.30, S, 8–10.30. Mr. PAPISH andMessrs. SHERBURNE and ———.

The construction and the use in chemical analysis of the spectroscope, polariscope, refractometer, colorimeter, and nephelometer. The laboratory instruction is devoted to the training of the student in the use of these instruments in the solving of chemical problems.

25. **Advanced Chemical Spectroscopy.** Laboratory practice. First term, credit two or more hours. Laboratory sections at hours to be arranged. Prerequisite, course 24. Mr. PAPISH and Messrs. SHERBURNE and ———.

The study of arc, spark, and absorption spectra and the application of spectroscopic methods to the identification of dye stuffs. Practice in one or more of the subjects mentioned may be selected by the student.

26. **Chemical Polarimetry and Refractometry.** Laboratory practice. Second term, credit two or more hours. Prerequisite, course 24. Laboratory sections at hours to be arranged. Mr. PAPISH and Messrs. SHERBURNE and ———.

The practical application of polarimeters, refractometers, colorimeters, and nephelometers to the solution of problems arising in the chemical laboratory, special emphasis being laid upon the advantages of different types of instruments.

27. **Spectrographic Methods.** Laboratory practice. Either term, credit one or more hours. Prerequisite, course 24. It is advisable that this course be preceded by Physics 18. Laboratory hours to be arranged. Mr. PAPISH.

The application of photographic methods to arc, spark, and absorption spectroscopy. Practice is also given in the applications of ultra-violet spectroscopy in chemical analysis, and in the recognition of lines and the reading of wave-lengths on photographs of spectra.

ORGANIC CHEMISTRY

30. **Introductory Organic Chemistry.** Throughout the year, credit six hours a term. Prerequisite, course 6 (or 7 and 12). Open to those who are taking course 12. Morse 119. Lectures and written reviews, M W F. 9. Laboratory sections, M T, 1–5.30; F, 1–5.30; and S, 8–12.30. Professor ORNDORFF and Mr. JACKSON and Messrs. CORNWELL, HEMMER, PURDY and JOHNSON.

The lectures and written reviews serve as an introduction to the general subject of the chemistry of the compounds of carbon. In the laboratory the student prepares a large number of typical compounds of carbon and familiarizes himself with their properties, reactions, and relations. The detection of inorganic elements in organic compounds and the recognition of various groups or radicals is included in the laboratory work.

31. **Introductory Organic Chemistry.** Throughout the year, credit three hours a term. Prerequisite, course 6 (or 7 and 12). Open to those who are taking course 12. Professor ORNDORFF and Mr. BEDIENT. M W F, 9, Morse 119. This course consists of the lectures and written reviews of course 30.

32. **Elementary Organic Chemistry.** First term, credit, with laboratory, six hours; lectures and recitations only, four hours. Students who are preparing for the study of medicine must take the laboratory work. Prerequisite, course 6 (or 7 and 12). Open to those who are taking course 12. Lectures and oral

and written reviews, M W F, 12, Franklin 10. Laboratory, M T, 2–5. Mr. JACKSON andMessrs. CORNWELL, BEDIENT, HEMMER, PURDY and KLINE.

33. **Special Chapters in Organic Chemistry.** Throughout the year, credit two hours a term. Prerequisite, course 30. T Th, 9, W. Sibley 1. Professor ORNDORFF and Mr. CORNWELL.

A presentation of certain important chapters of organic chemistry and discussion of selected classical researches in this field.

34. **Advanced Organic Chemistry.** Laboratory practice. Throughout the year, credit two to six hours a term. Open to those who have had or are taking course 33. Hours to be arranged. The laboratory is open daily. Professor ORNDORFF, Mr. JACKSON and Mr. CORNWELL.

An advanced course in the preparation of organic compounds. The original literature is consulted, and, before taking up original work in this field, the student is required to repeat some extended and important piece of work, and to compare his results with those published.

35. **The Coal Tar Dyestuffs.** Lectures. First term, credit one hour. Open to those who have had course 30 and have had or are taking course 33. Professor ORNDORFF. Time and place to be arranged.

Discussion of methods of manufacture of intermediates and dye-stuffs and of their properties, constitution, and relationships. The treatment is scientific rather than technical.

36. **Stereochemistry.** Second term, credit one hour. Prerequisite, course 30 or 31. Professor ORNDORFF. Time and place to be arranged.

The stereochemistry of the compounds of carbon and nitrogen. The necessity of considering the space relations of the atoms in certain classes of physical isomers is shown and the close agreement of facts and the theory is brought out.

37. **Methods of Organic Analysis.** Throughout the year, credit two to six hours a term. Prerequisite, course 30. Professor ORNDORFF and Mr. JACKSON. Hours to be arranged. The laboratory is open daily.

Practice in the qualitative and quantitative analyses of commercial organic products such as alcohols, ethers, organic acids, glycerin, formalin, acetates, coal tar distillates, petroleum products, soaps, acetanilid, etc.

38. **The Coal Tar Dyestuffs.** Laboratory practice. Throughout the year, credit two to four hours a term. Open to those who have had or are taking course 33. Professor ORNDORFF and Mr. JACKSON. Hours to be arranged.

Preparation of various intermediate products used in the preparation of dyes, and of representatives of the different groups of dyestuffs.

INORGANIC CHEMISTRY

46. **Advanced Inorganic Chemistry.** Throughout the year, credit two hours a term. Prerequisite, course 30, and open to those who have completed or are taking courses 50 and 51. Lectures, T Th, 11, Morse 119. Professor DENNIS and Mr. LIVANT.

Discussion of the chemical elements in the order in which they occur in the Periodic Table of Mendeléeff, with special attention to the group properties of the elements and to the relations of the groups to one another. The rare elements and the rare earths are treated in as great detail as are the more common elements.

47. **Advanced Inorganic Chemistry.** Laboratory practice. Either term, credit two, three, or four hours. Prerequisite, course 30. Professors DENNIS and BROWNE, Mr. PAPISH and Mr. LIVANT.

The study of the preparation, purification, properties and reactions of inorganic compounds, including those of the rarer elements. Instruction is also given in the elements of glass blowing.

Course 47 is designed to accompany course 46, but either course may be taken separately.

[48. **Selected Topics in Advanced Inorganic Chemistry.** Throughout the year, credit two hours a term. Prerequisite, course 30. Courses 50 and 51 should precede or accompany this course. T Th, 10. Professor BROWNE.

The lectures deal chiefly with (a) the hydronitrogens and their derivatives, (b) non-aqueous solutions, and (c) certain of the important recent advances in the field of inorganic chemistry.] Not given in 1920–1921.

[49. **Chemistry of Gases.** First term, credit one hour. Prerequisite, course 6 (or 7 and 12). Courses 19 and 20 should precede or accompany this course.]
Not given in 1920–1921.

PHYSICAL CHEMISTRY

50. **Introductory Physical Chemistry.** Throughout the year, credit three hours a term. Prerequisite, course 30 or 32, and Physics 2 and 8c. M W F, 9, Rockefeller B. Assistant Professor BRIGGS and Messrs. THOMPSON, BARTLETT and———.

A systematic presentation of modern chemical theory in which special attention is paid to the following topics: Gases, liquids, and solids; the theory of solution; reaction velocity, catalysis and chemical equilibrium; the Phase Rule; colloid chemistry; thermochemistry; photochemistry, and elementary electrochemistry.

It is advisable, but not obligatory, that course 51 accompany this course.

51. **Introductory Physical Chemistry.** Laboratory practice. Throughout the year, credit three hours a term. Open only to those who have taken or are taking course 50. Laboratory sections, M T, 2–4.30; Th F, 2–4.30; S, 8–1. Assistant Professor BRIGGS and Messrs. THOMPSON, BARTLETT and ———.

Qualitative and quantitative experiments illustrating the principles of physical chemistry and including practice in performing physical chemical measurements. An important feature of this course is the presentation of detailed reports based upon the data obtained in the laboratory.

52. **Advanced Physical Chemistry.** Lectures. Throughout the year, credit two hours a term. Prerequisite, course 50. T Th, 11. Professor BANCROFT.

An exposition of the law of mass action in its application to chemical equilibrium and reaction velocities.

53. **Applied Colloid Chemistry.** Lectures. Throughout the year, credit two hours a term. T Th, 10, Morse 119. Professor BANCROFT.

The theory of colloid chemistry and its application in the arts. Open to candidates for the degree of Bachelor of Chemistry if they have taken course 50; to others, only by special permission.

[55. **Theoretical Electrochemistry.** Lectures. Throughout the year, credit two hours a term.

The historical development of the subject with special reference to the theory of the voltaic cell. For advanced students in chemistry or physics.] Not given in 1920–1921.

56a. **Applied Electrochemistry.** Lectures. Throughout the year, credit two hours a term. Prerequisite, course 50. M W, 12, Morse 119. Assistant Professor BRIGGS and Mr. HOEL.

The theory of electrolysis and electromotive force; electrolytic extraction and refining of metals; electrolytic manufacture of organic and inorganic compounds; theory and practice of storage cells; preparation of compounds in the electric furnace.

It is advisable but not obligatory that course 56b accompany this course.

56b. **Applied Electrochemistry.** Throughout the year, credit two hours a term. Open to those who have taken courses 50 and 51, and have taken or are taking course 56a. Laboratory practice, F, 8–1; 2–5; S, 8–1; other hours may be arranged. Assistant Professor BRIGGS and Mr. HOEL.

Measurement of electrical constants; qualitative and quantitative study of conditions affecting electrolytic reactions; determination of current and energy efficiencies in electrolytic and electrothermal work; electrolytic preparation of organic and inorganic compounds; tests of storage cells; preparation of compounds in the electric furnace; measurement of high temperatures.

57. **Advanced Laboratory Practice.** Either term or throughout the year, credit not to exceed six hours a term. Prerequisite courses determined in each case by the professor in charge. Professor BANCROFT, Assistant Professor BRIGGS and Messrs. HOEL, THOMPSON, BARTLETT, ———. Hours and work to be arranged.

Students may elect in mass law, reaction velocity, or efficiency measurements with special reference to course 52; in photochemistry, photography, or colloid chemistry with special reference to course 53; in conductivity or electrometric determinations with special reference to course 55; in electrolytic or electric furnace products with special reference to course 56; in the application of physical chemical methods to organic chemistry.

CHEMICAL MICROSCOPY

65. **Introductory Chemical Microscopy.** Repeated second term, credit two hours. Prerequisite, course 6 (or 7 and 12). Lecture, F, 12, Morse 119. Laboratory sections, M T, 2–4; T Th, 10–12; Th, 2–4; F, 10–12. Professor CHAMOT and Mr. MASON.

The use of the microscope and its accessories; microscopic methods as applied to chemical investigations. The examination of crystalline compounds, recognition of textile and paper-making fibers, etc. The application of microscopic methods to quantitative analysis. The methods of microscopic investigation useful in metallurgical and chemical industries.

66. **Advanced Chemical Microscopy.** Laboratory practice. Either term, credit two or three hours. Prerequisite, course 65. Laboratory sections, M T, 2–4; T Th, 10–1; Th, 2–4; F, 10–12. Professor CHAMOT and Mr. MASON.

Practice in the examination and analysis of inorganic substances containing the more common elements with special reference to rapid qualitative methods and to the analysis of minute amounts of material.

[66a. **Advanced Chemical Microscopy.** Laboratory practice. Either term, credit two hours. Prerequisite, course 65. Professor CHAMOT.

Microscopic chemical qualitative analysis as applied to the study and analysis of organic compounds.] Not given in 1920–1921.

67. **Microscopy of Commercial Alloys.** Laboratory practice. Second term, credit two or three hours. Prerequisite, course 65. Professor CHAMOT and Mr. MASON. Laboratory sections at hours to be arranged.

An introduction to the methods employed in microscopic examinations of metals, alloys, and other metallurgical products. Practice in grinding, polishing, and etching specimens for microscopic study. Metallographic microscopes and their use.

This course may be extended to include other materials of construction.

68. **Microscopy of Foods and Beverages.** Laboratory practice. First term, credit two hours. Prerequisite, course 65. Professor CHAMOT and Mr. MASON. Laboratory sections at hours to be arranged.

The application of microscopic methods to the examination of foods and beverages for the purpose of ascertaining their purity and for the detection of deteriorations, adulterations, and admixtures.

SANITARY CHEMISTRY

70. **Introductory Sanitary Chemistry.** First term, credit four hours. Prerequisite, course 30 or 32. Lectures, T Th, 12, Morse 119. Laboratory sections, M T, 2–4.30; Th F, 2–4.30. Mr. GEORGIA and Mr. KENNEDY.

The lectures may be elected separately as a two-hour course.

Methods employed in the analysis of foods, beverages, and food accessories with special reference to the detection and determination of adulteration and spoilage; the relation of the chemical composition of materials used in the household to the public health.

71. **Introductory Sanitary Chemistry.** Second term, credit four hours. Prerequisite, course 30 or 32. Lectures, T Th, 12, Morse 119. Laboratory sections, M T, 2–4.30; Th F, 2–4.30. Mr. GEORGIA and Mr. KENNEDY.

The lectures may be elected separately as a two-hour course.

Sources of potable water; pollution of water supplies; physical, chemical, bacteriological and microscopical examination of water for household and municipal purposes; examination of sewage and sewage effluents; methods and control of water purification, water softening, sewage disposal, and garbage disposal. Interpretation of analytical results and the preparation of sanitary surveys.

72. **Chemistry of Foods and Food Products.** Second term, credit two hours. Prerequisite, course 30 or 32. Lectures, M W, 12. Place to be arranged. Professor CAVANAUGH.

The chemical composition, chemical properties and methods of manufacture of the principal foods and food products. Methods for the determination of the normal constituents of foods. Special attention is given to the chemistry of milk and milk products, cereal products, sugars, fruits, and fruit products.

75. **Advanced Sanitary Chemistry.** First term, credit two hours. Prerequisite, course 71. Lectures, T Th, 9, Morse —. Mr. GEORGIA.

The course is designed to meet the needs of those students who desire to specialize in the field of water purification and sewage disposal.

Laboratory work to accompany this course may be elected under course 78.

76. **Special Topics in Sanitary Chemistry.** Second term, credit two hours. Prerequisite, course 30 or 32. Lectures, T Th, 9, Morse —. Mr. GEORGIA.

A discussion of popular questions in this field. The topics considered in this course will be changed from year to year.

The lectures for 1920–1921 will deal with disinfectants and closely associated substances.

78. **Advanced Sanitary Chemistry.** Laboratory practice. Either term, credit two or more hours. Prerequisite, course 70 or 71. Both lectures and laboratory. Mr. GEORGIA and Mr. KENNEDY.

Students who have had adequate preparation may elect work in any branch of sanitary chemistry, or in the examination of water for special industrial purposes.

INDUSTRIAL CHEMISTRY

80. **Introductory Industrial Chemistry.** Throughout the year, credit three hours a term. Prerequisite, course 50. Seniors who are taking course 50 may by special permission be admitted to this course. Lectures, M W F, 10, Morse 119. Professor RHODES.

A discussion of various typical processes of chemical manufacturing from the standpoint of:

a. Available materials, their properties and limitations,
b. Standard forms of apparatus used in chemical manufacturing,
c. Properties and specifications of commercial chemicals,
d. Computation of costs and profits in chemical manufacturing.

81. **Advanced Industrial Chemistry.** Second term, credit two hours. Prerequisite, course 50 and the first term of course 80. Lectures T Th, 10. Morse —. Professor RHODES.

Detailed discussion of selected processes of the chemical industries.

In 1920–1921 the topics will include the preparation of "crudes" and "intermediates" from coal tar, the manufacture of Portland cement, and the refining of crude salt.

82. **Advanced Industrial Chemistry.** Laboratory practice. Either term, credit two, three or four hours. Prerequisite, course 50. Professor RHODES.

The study in the laboratory of the processes and materials that are used in the chemical industries.

84. **Engineering Chemistry.** Repeated in second term, credit two hours. Prerequisite, course 1. Lectures M W, 8, Rockefeller A. Professor RHODES.

Chemistry in its relations to engineering.

AGRICULTURAL CHEMISTRY

85. **Agricultural Chemistry, General Course.** Second term, credit four hours. Lectures, M W F, 11. Rockefeller B. One recitation, to be arranged. Professor CAVANAUGH.

The relation of chemistry to agriculture, and an introduction to the study of the composition and chemical properties of plants, fertilizers, feedstuffs, insecticides, and fungicides.

87. **Chemistry of Fertilizers and Insecticides.** First term, credit three hours. Prerequisite, course 85. It is recommended but not required that this course be preceded by course 86 and accompanied by course 88. Lectures, M W F, 10, Morse —. Professor CAVANAUGH.

A more detailed study of the chemistry of fertilizers and insecticides than is covered in course 85. The preparation, manufacture, and properties of old and new fertilizers and insecticides. Methods of sampling and analysis used by the Association of Official Agricultural Chemists.

(For courses 86 and 88 see the announcement of the College of Agriculture.)

100. **Chemistry of Insecticides and Fungicides, Advanced Course.** Either term, credit two or more hours. Prerequisite, courses 87 and 88. Hours to be arranged. Professor CAVANAUGH.

SEMINARY

95. **Seminary.** Credit one hour. For seniors who are candidates for the degree of Bachelor of Chemistry. Morse 119.

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96. **Research for Undergraduate Students.** Throughout the year.

Candidates for the degree of Bachelor of Chemistry are required to take eight hours in research during the senior year under the direction of a member of the staff of instruction to be selected by the student.

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